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ABSTRACT

A study examined whether imaging is a universal ability that can be used by learners, and if it can be developed for more effective use once the learner can observe the role of imaging in his or her own mental activity. Subjects, 196 students in college upperclass writing classes, graduate level workshops, basic writing classes, an undergraduate fiction reading class, a film class, and in a National Writing Program Summer Institute, completed a questionnaire and a "Mental Process Essay," in which they explored their thoughts on their own thinking, reading, and writing processes. Results indicated that all but one of the subjects responded with an unequivocal "yes" on visual imagery and that subjects reported (in decreasing order) imagery involving auditory, feeling, smell, and taste senses. Examples from the data categories of the senses, literacy skills, and mental skills illustrate the findings. Findings suggest that imaging is universal: it can be used by all learners. (A theory of imaging and 19 references are attached.) (RS)

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IMAGING FOR LITERACY LEARNING

A Reflective Teaching Inquiry

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June 1991

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IMAGING FOR LITERACY LEARNING

A Reflective Teaching Inquiry

SO WHAT?

Any learner involved in reflective teaching as a mode of inquiry needs to answer her colleague's question: Why bother to study imaging? What good will it do us in education? So What?

If we know more about how our thinking processes work, we can wield them to our advantage, and, as teachers, we can help others learn to do so. Mental abilities are terribly elusive. Asking a person to observe mental processes is initially a very frustrating request -- some are at a loss trying to observe what's going on mentally. Many of these processes are invisible to us, such as those that make the heart and lungs work continuously and automatically, or those which cause us to feel depressed, or happy.

Imaging, however, is one mental skill that we can be aware of, that we can observe going on in ourselves. As such, it's a way to "get a handle on" our mental activity. First we must recognize it, which is one purpose of the Imaging Questionnaire which follows. Then, we can get in closer touch with it. Though guided imagery is probably the use of imagery most commonly known, for relaxation and personal growth, imaging is coming to be used in other areas of learning such as weight control, i.e. keeping the desired self-image in mind as an inspiration to eat sensibly. Learning to use imaging in these more personal kinds of ways teaches us how to use it as a mental tool. Once familiar with it, the learner can apply it to more academic pursuits or whatever learning goals desired. For instance, imaging the projected audience for a speech or

written paper gives you a preparatory sense of how to arrange and express your ideas to home in on how the audience could best identify with and understand your point of view. After immersion in an idea, the mental play of images offers the material to write, or paint, or to express through any art or communication medium. Awareness of this mental faculty provides the grist for whatever line of thought one pursues. The writer, for instance, often tries out this word, that line, in auditory imaging before setting words to paper.

The logical outcome of such a recognition of images is learning to use the images that come spontaneously as well as to self-direct images to guide your thinking in ways that you want it to go. If you need to get started writing a paper, for instance, it might help to image yourself sitting down and writing successfully.

Directing imaging to achieve thought results that you desire is a way of learning to use a natural mental resource more fruitfully. Imaging applied to projection may be one of the single most important abilities we have: it is the vehicle through which we dream of the things we want to do and then guide ourselves to imagine the steps necessary to achieve our dreamed goals.

Thus, I propose that imaging is an important skill, which, as educators, we can help our students to identify, understand, and put to work for themselves. The proposition to **use** imaging is a pragmatic gesture that takes us beyond purely theoretical speculations about how we learn and gives us opportunities to practice--and enhance--our learning abilities.

A DEFINITION OF IMAGING

To introduce what I mean by the term *imaging*, let me call to mind what you know about imagery. Imagery is a phenomenon you're probably already familiar with, such as visual images of persons and places we see in the mind's eye in our in dreams. Visual memory helps us recognize the many faces we are familiar with.

In poetry, imagery is the artful use of verbal language to create vivid pictures in our minds, like William Carlos Williams' poem about "a red wheel/barrow/glazed with rain/water/beside the white/chickens."

Many of us are probably most familiar with imagery that is visual, but the other senses can be involved in our images in the same way that the visual one is. While we recognize faces visually, we may be familiar aurally with the voices of people we know. Thus, as we see in the mind's eye, we also hear in the mind's ear--hearing a song in the mind over-and-over all day, or the sound of a voice saying these words when you read silently.

Another sense, that of feeling, has many different interpretations, such as movement, touch or emotional feeling. One way to perceive feeling imagery is to imagine what it feels like to walk across the room, or, in a dream, to feel yourself falling. Or flying.

Dreams and memories, momentary thoughts and projections are often available to us as images related to several senses, combined to represent what we feel as a sense of reality. Imagine, or *image*, what it feels like to run down a hot, sunny street, your feet

pounding blacktop pavement, sweat about to drip into your eyes -- then soothed by a sudden breeze brushing across your face and cooling your scalp.

One way to learn sports is to watch someone else to get a picture and a feeling of a correct movement, like serving a tennis ball. Then you imagine the same movement for yourself so you get the feel of it. And then practice it. Or, you might practice -- in your mental imaging -- movement skills like typing, or the movements and sound of playing a musical instrument.

Smell and taste are the other two commonly thought-of senses. One way smells operate is to stimulate a thought of some person from the past when you smell a certain cologne, for instance. Can you smell in your imaging? How do you experience taste in your mental imaging?

Imaging is the verb corresponding to the noun imagery. It is the **action** of experiencing perceptual information. It is seeing or hearing something in the mind when there is no corresponding external stimulus. The mental action going on when we mentally picture our bedroom, for instance, is similar to what is happening in the mind at the moment we are actually seeing the bedroom.

IMAGING QUESTIONNAIRE

To experience your own imaging, read through the following imaging questionnaire and fill in -- at least mentally -- your answers to the questions about imaging in the different sensory modes. This Questionnaire is one of two instruments (the other the Mental Process Essay explained later) used for collecting the data reported in the inquiry here. This Questionnaire, in conjunction with the more in-depth

Mental Process Essay that asks for a finished piece of writing on the subject of the learner's own mental processes, teaches the skill of thinking and writing about ongoing mental processes. Culminating in a thoughtfully written account of mental processes covering an extended period of time (a fifteen-week semester for the students involved in this inquiry), this method provides a way to bring into public view the very private mental operations so difficult to observe.

In the spaces below, please begin by answering the question with a **yes** or **no**, and then give an example or an explanation of your answer.

1. **Vision.** Do you see in your mind's eye? Can you see green trees and bushes? Or your bedroom?

2. **Sound.** Do you hear in your mind's ear? For instance, can you hear the words in this question spoken in your mind? Or a song?

3. **Feeling.** Do you have images of feeling? Consider the feelings of **movement**, like running or falling; of the **touch** of your fingertip on sandpaper; of **body sensations** such as pain, or balance; or the feeling of **emotion**.

4. Do you have **smell** images? How do you experience smell in your mental imaging?

5. Do you have **taste** images? How do you experience taste in your mental imaging?

6. How does your imaging function when you **write**? Give examples from writing experiences you can remember.

7. How does your imaging function when you **read**? Give examples. Do you see, hear, feel, smell, or taste in your imagination when you read?

8. Please describe some way that you have learned to **use your mind** to accomplish school or learning tasks of any kind (for instance, listening to someone give you directions to some destination).

EXAMPLES OF IMAGING IN "THE LITERATURE"

The study of imagery had a long historical significance as least as far back as Aristotle who believed that knowing is never without images: even though knowing is not the same as having images, he thought, it cannot dispense with images (Randall, 1960, pp. 94-97).

Imagery was virtually abandoned for several decades in the early part of the 20th century. At one point, scientists operating under the constraints of strict behaviorism questioned even the existence of imaging because it could not be empirically observed. This kind of question may have been the stimulus for studies that sought to establish the existence of the general mental ability of imaging (Shepard, 1971; Kosslyn, 1980). Recently imagery studies have been revived in terms of mental representation.

Now mental operations such as the process of imaging are taken for granted by cognitive scientists like Howard Gardner (1984, p. 383). And neurobiologists are learning much about the brain processes for producing language (Sacks, 1985).

One psychologist (B. R. Bugelski) states that reading is an imaging process. Reading is so important and complex, he says, that "its comprehension would amount to an understanding of how the mind works." He argues that "reading for sense is a matter of arousing feelings and images" and that meaning "emerges as a matter of tapping prior experience in terms of imaging and feeling." His research led him to believe that thinking and the act of reading share the same underlying neural activity: "They both consist of generating series of images wherein one image is incorporated with another. . . . Language," he says, "does not communicate. It merely arouses private and highly

personal imagery and feelings. The problem of communication is not one of using the same words, it is that the words mean the same thing, that is, give rise to the same imagery and feeling" (Bugelski, 1968).

Piaget, in Mental Imagery in the Child, maintains that the role of imagery is to imitate. It is the way children imitate models, beginning with the simple and moving to more complex as intelligence develops. Imagery ability, he says, is closely integrated with the other developmental functions.

Sylvia Ashton-Warner's concept of the Key Vocabulary is based on the action of imaging. Her work with young children sought to bring out images they had strong feelings about. She wrote their words--such as "Mommy", "Daddy", "kiss", "frightened," "ghost"-- on big cards to name these images. Then she gave these words to the children as the first words they would learn to read. With these emotionally-charged words, Ashton-Warner moved to get children involved with reading by using the images that had power in their minds and their lives. She herself said of her writing that what she did was to look inward at her own imagery, and she just typed it.

The example of Einstein's comments on his imaging is a famous one: When he was asked to describe what kind of internal or mental images he made use of in his thinking, Einstein answered that "The psychical entities which seem to serve as elements in thought are certain signs and more or less clear images which can be 'voluntarily' reproduced and combined." He described his thinking process as a kind of combinatory playing with these elements for the purpose of arriving at logically connected concepts. He explained further that "The above mentioned elements are, in my case, of visual and some of muscular type. Conventional words or other signs have to be sought for

laboriously only in a secondary stage, when the mentioned associative play is sufficiently established and can be reproduced at will" (Ghiselin, 1952, pp. 32-33).

For Einstein, then, imaging was the basis for the creative thinking that precedes external expression. A similar phenomenon can be seen in the auditory imaging of composer Henry Cowell. He "repeatedly practiced hearing over and over 'in his head' musical selections that he had heard. In the course of this self-training, he began to 'hear,' first in bits and snippets and then in longer passages, new compositions." This use of imaging as the precursor to external expression, like the Einstein example, is evident in his further explanation: "'With superhuman effort,' Cowell says, 'he finally gained control of this spontaneous imagery, was able to hold it in memory as he had learned to hold the music that he had actually heard, and could write it down'" (Shoben, 1980, pp 28-29).

It is clear that different persons excel in different sensory modes, and thus that imaging may be easier for a person in one sensory mode rather than another (Notebooks of the Mind, and in my research data). That *visual* imaging is not the only important kind of sensory imaging is evident in "The Man Who Mistook His Wife for a Hat." Neurologist Oliver Sacks tells the story of Mr. P. who lost his ability to comprehend the meaning of visual information because of a problem in the visual area of his brain. His visual deficit revealed itself when he reached over and took hold of his wife's hair, thinking it was his hat. Though he could see perfectly well, what he saw had lost its meaning for him. However, he still had other sensory powers intact, especially hearing of music. The interesting thing about him was that he learned to function by applying his musical mental imaging to activities that most others handle visually: he recognized people by the sound of their voices, and he had a running aural image of music to help him accomplish motor tasks. For example, he dressed to music, ate to music, etc.

Eudora Welty gives us another example of how auditory imaging works for her as a writer and reader: "Ever since I was first read to, then started reading to myself, there has never been a line read that I didn't hear. As my eyes followed the sentence, a voice was saying it silently to me. It isn't my mother's voice, or the voice of any person I can identify, certainly not of my own. It is human, but inward, and it is inwardly that I listen to it (pp. 12-13, One Writer's Beginnings).

In addition to special incidences of its use in the thinking of creative people, imaging is coming to be seen as a strong entity in the ordinary thinking of everyday life. As a juror, for instance, I listen carefully to the words of lawyers and witnesses, struggling to construct my own image of the events they describe. I become aware of the role that visual as well as hearing and feeling images play in building my conception of what happened.

Or, in another example that integrates different modes of sensory imaging, I sit in my study and project a sense of myself swimming: Using the technique of imaging to improve my swimming skill, I see myself moving through the bluegreen water of the pool; I hear the rhythmic thunder of my breath escaping to the top of the water in noisy bubbles; I feel the kinesthetic challenge of coordinating my breathing with neck, shoulder, arm, and leg movements; I feel also the tactile coolness of the water slipping easily along my body, the visceral pounding of my heart to pump oxygen-filled blood to the periphery of my limbs; and I feel the emotional elation of working myself hard enough to increase my strength and endurance.

My imaging is the medium through which I am aware of the messages within my mental system. I regard imaging as my mind's system of communication, giving me

conscious awareness of the brain messages that are available to me. Imaging in the various sensory modes comprises an internal representation system underlying literacy learning. These are ideas I will develop later in the theory section of this paper.

One objection sometimes arising to such a general theory of imaging in mental processes is that the examples seem to be about very concrete sensory thinking. How can we experience in our imaging the abstraction that seems to pervade much of our higher-level thinking? Let me present an example from Walter Ong in which he explains how the abstract concept "between" might be formed as a body image: ". . . the concept 'between' . . . is an existential formation based on experience of one's own body and its inwardness and outwardness. I feel myself inside my own body and everything else is outside of it. That is what 'in' and 'out' mean -- these terms point out this situation which I experience and enable me to use it as an analogue for other situations. 'In' situates the meaning of 'between'. 'Between' is a kind of inwardness --we say 'in between' these two points, and there is no way to manage 'out between' (Ong, 1977, p. 46).

Let me tie in imaging to other strains of cognitive investigation. Exploring imaging is a meta-thinking process: it is thinking about thinking. Earlier I said that imaging is a way to get a "handle" on thinking process. It is a way of gaining access to the thinking process -- it is a way to, in other words, think about thinking. Just as meta-language is language about language, like grammar, so imaging is meta-thinking--a way to think about thinking.

"So what" is important about imaging? Enough evidence can help us understand it as a basic, organic (even biological) mental process we can become aware of and put to work to help us accomplish leaarning tasks. The purpose of the inquiry reported here is

to gather that evidence -- first from the exceptional examples in the scholarly literature on this long-studied subject. But, perhaps more importantly, the inquiry seeks to find out if imaging is a universal ability that can be used by learners, and if it can be developed for more effective use once the learner can observe the role of imaging in his or her own mental activity.

QUESTIONS GUIDING THE INQUIRY:

Does everyone image? Is imaging universal?

How are the senses related to imaging?

How do different individuals use imaging differently?

How do we use imaging for literacy learning?

How do we use it for thinking in general?

REFLECTIVE TEACHING AS A MODE OF INQUIRY

I use "reflective teaching" as a term to identify my mode of inquiry (following the discussion of *inquiry* by Janet Emig in Web of Meaning). My purpose is to focus on my teaching to assess its effectiveness. The means of assessment adapts empirical research methods for non-abusive use in the classroom (questionnaire and case study used here).

In my interpretation, reflective teaching as a mode of inquiry applies concepts of empirical research methods in such a way as not to violate conditions for learning. "Supply the conditions for learning," Sylvia Ashton-Warner wrote. But as I learned when I conducted experimental research in public school classrooms, researchers threaten the optimum learning conditions. The testing component of research can be especially detrimental, even to the point of abusiveness.

Reflective teaching, instead, adapts and modifies research methods to use them in such a way as to benefit the classroom, monitored always by a sensitive teacher. Reflective teaching studies provide a workable means of evaluating teaching, as well as a commitment to mental activity that can help keep teachers intellectually alive.

By studying my teaching methods and the results I see in my students, I can better understand what I do and how I could improve my teaching. What's more, connecting teaching with inquiry is indicative of an **attitude:** an attitude of wanting to know, to improve. With the informal nature of classroom inquiry, we can control better how the classroom is used: a study might be one we do ourselves in our own classroom, or in someone else's classroom; or we could have someone we trust observing and/or

participating in our classroom. I offer this inquiry report as a realistic example of how concepts, methods, and practices of research can be put to work in teachers' reflective inquiries.

I have taken research methodologies from the different strains of research in composition, psychology and the social sciences. Some years ago, experimental research using quantitative data as a basis was the major kind of research available to educators. But now an acceptance of qualitative "observations" gives us access to methods from fields like anthropology, sociology, linguistics, even literary theory to use in our inquiries.

Questionnaire: From sociological research, I have taken the idea of the questionnaire. Written answers to questions provide a valid way of learning what people think. The questionnaire you did at the beginning of this article is one of the two major instruments that I used. I gave it to my students in several of the writing classes I teach: at college upperclass level, in a graduate level workshop, and what we call English 100, Basic Writing. I used it also in my undergraduate fiction reading class, a film class, and in a National Writing Project Summer Institute. A few of the questionnaires also come from professional groups.

Statistics: I have taken the concept of statistics from experimental research, used in my study as simple percentages. I have counted the number of respondents who say they image in each sense, and from the totals I have figured the percentages of people with positive answers in each category.

Protocols: From a variation on protocol analysis I have taken my second major instrument, the Mental Process Essay that students write. Usually in protocols a

writer is asked to think aloud -- to give a running oral representation of what is happening mentally while writing a paper on a given topic. My variation of protocol analysis uses retrospective reports of what went on in one's mind while writing. For this assignment, my students record in their writer's notebooks their self-reported thinking processes. These notebook entries, written regularly through the whole semester, comprise the raw material from which they write the Mental Process Essay. The initial questionnaire taps such protocols, but this final essay for the course asks students to explore their thoughts in more detail, giving examples from the writing they do during the semester.

This Mental Process Essay is the "final exam" for the course. I have produced a class book called Imaging and Writing that students are required to buy at the local photocopy shop as one of their required texts.

Imaging and Writing presents the major thrusts of the course so students can read about the course on their own. In it I have a chapter on writing the Mental Process Essay, which we work on during the whole semester, using the Imaging Questionnaire at the very beginning of the class to stimulate thought about imaging. Throughout the semester I require students to write in a notebook and turn in each week a record of their thinking, writing, and reading processes, with some allusion to how they experience imaging. All of this material feeds into the final essay. Essentially it is a continuation of the questions on the Questionnaire that we approach through class discussion and informal notebook writing.

The following chart shows the results of the five yes-no questions on the 196 questionnaires asking about sensory imaging.

THE DATA -- RESULTS

coding of questionnaires:

X = yes - = no ? = equivocal blank = no answer

Positive responses (X) to sensory categories:

Sense	Total yes	Percentage
Visual	195	99.5
Auditory	186	94.9
Feeling: (motor, emotion)	183	93.4
Smell	155	79.0
Taste	144	73.5

100% of respondents report imaging in one or more senses.

As you can see, all but one respondent answered an unequivocal **yes** on visual imaging. In answer to the question "Do you see in your mind's eye?", the only one who didn't give an unequivocal yes said: "Not particularly. When I do, it's often blurry and indistinct." Although I did not count this as a **yes**, I think it's correct to interpret that

this person does have visual mental images. In addition, this same person answered that feeling is "my strongest sensation--whether it be a physical situation (hot or cold) or emotional." About auditory, he said: "I hear my own voice when I want to try out a phrase I'm thinking of writing." And when writing, "I image the size and structure the piece will take, as well as certain sections that will serve as concrete examples of what I am trying to say."

The only other person I've ever heard say he didn't have visual mental images was the interesting case of an artist. He felt the need to construct visual works of art because this action helped to clarify the image outside himself. He felt frustrated that he did not have clear visual mental imagery. This person, in fact, might be the stimulus that got me started asking questions about imaging and thinking in the direction that finally produced the present study.

CODING OF THE DATA

To further organize and order the data examples from these two instruments, I have coded information from them as follows:

DATA CODING CATEGORIES

The Senses

- visual
- auditory
- feeling (motor, emotion)
- smell
- taste
- integrated sensory image

The Literacy Skills

- reading
- writing

The Mental Skills

- memory
- dreaming
- day dreaming
- projection
- momentary stream of consciousnes
- general mental skills

EXAMPLES FROM THE DATA

What follows is a report of examples from the Questionnaire (Q) and the Mental Process Essay (MPE) data, organized by the data coding categories.

VISUAL

Visual imaging, reported by almost 100 percent of respondents, is the quintessential imaging ability that I have used as the basis of my definition of imaging, using visual imagery as a bridge to understanding imaging in all the senses. What follows are a few of the interesting examples.

"I am a real structure freak. I see structures in texts that I read and those I create." (Q 48)

"I have always thought of certain concepts, especially ones involving time, in visual terms. The year, for example is an oval with May at one end and September at another. I place myself on this oval and am able to 'see' how long it is to events in the near future. I see weeks in a similar way, as a long hall of doorways, evenly spaced apart. The days are the open doorways, the nights are the solid wall. Again, I can 'see' time. I don't remember consciously visualizing these time concepts, but I do remember using them as a young child, perhaps around 4 or 5 years old." (Q 157)

"I image so strongly [visually] as to raise my pulse and heartrate. I can rapid-fire sequential mental images or freeze-frame at any given time." (Q 55)

"My visual imagery is stronger because before you image taste or smell, you first visualize what it looks like. I can almost always visualize something that I may not be able to image smelling, etc." (Q 143)

"I've recently learned how to knit, which I found very difficult. I had to force myself to concentrate on throwing the yarn counterclockwise. The easiest way to do this was to 'see' a clock with the hands going backwards
-- as soon as I mastered that, the rest of the stitches came naturally." (Q 145)

"I'm very visual. I can't spell unless I see the letters in my mind. I can call most images to mind with specificity." (Q 149)

AUDITORY

"I don't see a word spelled in my minds's eye, as mentioned above. When I spell new words I have to sound them out in my mind or out loud." (Q 145)

"I hear, listen, talk in my head almost all the time. Sound is my key image . . . . Often I carry on a dialogue in my head and one of the voices isn't 'me.' Sometimes I talk in my head to specific audiences or specific people. The specific people I talk to in my head may just be appropriate listeners or they may be people I have talked to about the subject or am planning to talk to about the subject. Also like the example in the text, I often listen to music in my mind. I do this both deliberately and involuntarily. (I just wish I could carry a tune -- imaging doesn't guarantee good performance." (Q 158)

"I hear sound in a way that I can feel it, like a blanket falling over me on a bed. I can feel the sound waves move over my body as they are made and search out in space to be heard." (Q 81)

"Excitement: "I hear loud music in my head when I get psyched about something." (Q 138)

"I 'hear' sentences as I write them. However, I find myself wrting in a more lofty, elevated voice than I normally speak. It always sounds very stilted -- unless I'm writing a letter to a friend -- then I sound like the way I speak." (Q 145)

FEELING/MOTOR/EMOTION/SPATIAL

"Yes, I feel in my thoughts. What seems so strange is that I often feel things that have never happened. For example, this summer I was in NYC and spent a couple of hours on top of the Empire State Building. I have a fear of heights, but up there I was not afraid. It was open and windy and very high. However, there were so many anti-fall and anti-jump things around that it was safe-safe-safe. Since I have returned, and on more than one occasion, I have felt myself falling over the edge of the Empire State Building and being very frightened and actually tensing up for the fall." (Q 153)

"I can feel the movement on a bicycle, riding down hill, the wind blowing against my face and my chest." (Q 152)

Emotion: "The quotes which I chose evoked emotion in me, and I think that sparked a little life into the paper." (Q 159)

"My imagery of feeling is stronger than all the others. If I can see or hear something somehow, I can feel it. I can feel when something bad or good is going to happen." (Q 140)

Spatial/movement: "I plan my shopping by mentally walking through the store and picking up what I want to buy. I think this is similar to the mnemonic devices used by classical orators. I study this way also, assigning bits of information to places (like locations in my house) so that I can mentally walk and pick up the information in the order I need it." (Q 157)

"When I was a child, waiting for someone to pick me up, I used to imagine the car driving along the streets coming to get me." (Q 154)

SMELL AND TASTE

"Yes, I have smell images. I can't think of smells, but some smells bring back memories. Food smells are especially memory-evoking. I want to write something that uses the smell of cold. I like the way clothes and skin smell after thay have been in the cold and wind. Whenever I smell cold, I think about times before that I have smelled it. (Q 153)

"Certain tastes trigger memories but I have difficulty in formulating a mental image of a particular taste without physically eating or drinking." (Q 150)

"Certain cleaners remind me of elementary school and also of the hospital where a close friend was treated for cancer." (Q 150)

"I can remember things tasting cold or salty or creamy or sweet, but I cannot recapture the taste itself the way I can recapture sounds, feelings or sights." (Q 157)

Smell and taste: "My sense of taste and smell are closely intertwined and very intense. You might think of me as a sort of a 'Pavlov person.' I love to eat. When I smell rich, gourmet food, I almost salivate, almost feel the texture of the food against my tongue. On the other hand, I'll never forget the time I smelled and tasted a chittling. To this day, certain disgusting odors reconjure that image. I can't help but wrinkle my nose, my teeth scrape the surface of my tongue to remove the coating which seems to cover it. And, if I'm not in public, I'll probably spit!" (Q 159)

INTEGRATED SENSORY

"I have a sort of grid in my mind. Spatial separation is how I study and how I take notes: I think of one main idea and four or five subheadings. Though this is mostly visual, I can recall aural sensations if I get stuck in a rut." (Q 149)

"I use kinesthetic imaging to relax. Of course, this is usually combined with visual and aural imagery. When I image the feeling of the sun on my neck, I also hear the ocean and see the pier. I also use feeling to plan how I will -- or want to -- behave in a situation. I plan (and see) how a situation will be and how I will act. Sometimes, negative feelings (physical ones) will affect my attitude about a forthcoming event." (Q 158)

"Welcome to my mind!
Don't be surprised by the unending rivers,

By the shining lights you find,

Or the shades and colors. . .

They mingle and separate and unite again,

They tie and untie, these threads of silver,

These webs of joy and surfaces of pain,

These paths fairydusted with unreal glimmer. . .

And look, here's the workshop!

These little grey pulsing centers,

This little bridge here, and this little loft

Are the interesting keepers

Of images--the flashes of red,

The shades of blue,

The joys of the living and the loss of the dead,

Facts that but seem -- no, these are true,

And here are assorted varieties

Of sounds present too!

This is the lyric of a song I heard,

This, the pitter-patter of rain,

And this is the confluence of word

And pictures, that I paint. . .

See, here's a touch of yellow,

And can you hear it?

Yellow is mellow,

Pure yellow it is. . .

Here's blue with the beat

Of a well-timed drum,

Here's red with the streak

Of a flute-- and here's one

That takes on all these

And wets the tip of a brush,

And all's music and color

That I cherish so much!

And that carbon arc of bluish white

Is the ray of inspiration,

It always is light

That creates in confusion. . . "

(MPE 4)

THE LITERACY SKILLS

"Whether I am interpreting material or writing creatively the sights and sounds of the material flash in my mind's eye." (Q 154)

READING

"When I'm reading, I can usually use all the senses that the writer is trying to stimulate. For instance, when I'm reading about a man on a sailing ship, I can see the horizon, the texture of the wood, the fraying of the ropes, even when the author isn't describing those specific things." (Q 56)

"Most everything that I read has to be processed through mental images. If it didn't, things would be incomprehensible and hard to grasp." (Q 139)

". . . I use mental images based on my experiences to structure the visions in my imagination as I read." (Q 150)

"Most material I read and try, where applicable, to contextualize. That is, I try as much as possible to relate it to my background, or country. I try to see how applicable it would be. That way I remember it." (Q 152)

"As I read, I form mental images of the characters and scenes which are described. Experiencing sights, sounds, and smells with my envisioned characters, I lose myself in the storyline. I have the distinct memory of being depressed for an entire weekend because my heroine was jilted -- and I was at the beach!

"I associate the fictitious characters and events with people whom I have met and things which I have experienced, thereby internalizing the story. If I am strongly drawn to a character, I can identify myself with him or her and actually experience the emotions which they experience. I have actually had flashes, for instance, of what it would feel like to be in a car accident. . . the surprise, the fear, and the pain of being smashed against a dashboard and having muscles ripped, skin torn, and bones broken." (Q 159)

WRITING

"When I am writing, I tend to 'see' an outline that fills itself out with details as I write. When I am writing fiction, I picture each scene that leads to the next scene, each character, and what is going on around that character." (Q 108)

". . . I search my notes or my somewhat active thought processes for ideas. I force my mind to run through my material until I find the basic point I want to make. Once I've identified that point, I can almost write without consciously thinking. The thinking comes during revision when I add what I've forgotten or take out what doesn't need to be there." (Q 108)

"Ideas come at unexpected moments while doing trivial things--like washing dishes or walking along the campus -- a light would come on and my thoughts took on shape and meaning. At times I could hear what I would say about life and death before I started writing." (Q 110)

"Normally I am so confused when I write and my hand hurts so much that I don't realize I'm imagining anything. But the way my mind works when I write is that I hear this voice (not a spooky voice) and it tells me what to write. So I write it down. Often I don't know what I wrote till I read it." (Q 138)

"If I'm writing a story, I see what's happening in my mind: setting, facial expression. When writing an academic paper, I imagine my audience and how they might react (facial expressions, etc.) to my writing." (Q 149)

"In an ideal situation, I associate my ideas with visual images, order those images so that they form a complete action or story, and then try to "describe" the picture or action to my audience. I would say that a technical paper lends itself to the analogy of an action in progress while a creative piece of fiction is made up of a series of very detailed visual images in which I experience the character's emotions and the environment and then try to communicate the sensual experience to the audience. . . . The concept of a technical piece as an imagined progressive action is more of a framework aid for me than

anything else. I can analogize the commentary on a technical process (such as the use of Aristotle's topics) to an action in progress such as a golf swing or a swing at a softball. Explaining the technical terminology in rhetoric is much like putting the body in the correct stance for a good swing. Explaining the use of the topics is like starting the swing towards the ball for a solid contact. Explaining the potential use of rhetoric in the 20th century classrooms is comparable to a hard, solid contact and (hopefully) a smooth follow through." (Q 159)

"I am not aware of imaging when I am drafting fast, when my writing 'flows,' so to speak. However, when I slow down, when writing gets tough, or especially when I am searching for examples, I hear words in my head and I get feelings of looking in my mind for the right illustration. I can see in my mind spaces that need to be connected. . . again, I see structure or the need for structure, but I really am not aware of seeing 'pictures.' I also hear texts from my memory. Something from another text will pop into my head as a sentence or a voice." (Q 158)

THE MENTAL SKILLS

MEMORY

". . . [I] retain information gained in class because I can attach mental images to the material that is being considered." (Q 56)

"I've learned to remember pages photographically in my mind. Although I still study a great deal, if I have a question on a test I can't remember, I try to close my eyes and remember the pages of my notes in my mind. Then, I can usually remember the word or note by this activity. This has saved me countless points on test papers." (Q 68)

"When I was in the band from the 5th grade until the 11th grade, I had to remember a great deal of musical pieces. The only way that I remembered them was to put a picture of each measure in my head and play it." (Q 70)

". . . when trying to find a lost item. I'll recreate what I was doing the last time I recall having the item. The recreation may include images of a song or meal or conversation." (Q 155)

DREAMING

"Often when I see something that I take notice of I can convert the same image into my mind's eye. Also, this image that I have obviously concentrated on is likely to appear in my dreams, possibly it could appear with a new meaning." (Q 101)

"Through reading . . . I usually create an entire scenario/atmosphere from whatever I'm reading. I just realized that I sometimes see these images again in dreams I may have." (Q 23)

"Whenever I write, I use imagery from my daydreams and from the dreams that I have at night. For example, when I picture thoughts or ideas for my paper while I am sleeping, I either try to remember the ideas and jot them down after I wake up or I will get up in the middle of the night to write information down before forgetting it." (Q 116)

DAY DREAMING

"The second mystery of my writing process concerns its power over my mind. When I give in, the emerging idea moves into my conscious mind and dominates my thoughts. The inner dialogue that is almost always present in my mind begins to focus on the subject of the writing. In addition, I begin to see, and believe in, the purpose of the writing. I envision an audience and a response. I hear myself talking to the audience. And I begin to get wrapped up in the feeling of producing something that will have some kind of effect somewhere, even though I haven't started producing it. This stage of my writing process is very much like a fantasy, or a focused daydream. The entire writing situation is quite vivid in my mind; my mind becomes a theater with scenery, actors, voices, motives, actions, even applause and music.. . .

"While I am drafting, I drift back and forth between being conscious of the words on the screen and daydreaming. My daydreams in this stage are different from the ones of the planning stage, however. While I am drafting, I usually think ahead about points that still have to be written. I think that the structure is motivating me to remember what the whole point of the piece is, to keep focused on the goal. This daydreaming often prompts me to delete or revise material I have previously drafted." (MPE 1)

PROJECTION

"Through focusing, or concentration, I can clear my mind of extraneous thoughts and focus on a particular act or movement, rehearsing it over and over in my mind. I picture an opponent's action and my response. I mentally rehearse even simple things like meeting my child's teacher or bargaining for a new car. This provides me 'experience' before I actually conduct my personal affairs." (Q 55)

"I make up the worst possible outcome for a current situation, which is really a great motivator for me." (Q 101)

[heuristic] "Twisting the situation -- imagining something other than the way it is described in what I read. For example, I take the end of Joyce's 'Araby' and wonder what would have happened if he had acquired enough money to buy Managan's sister something. Would she have liked him any better? Would he have been cheated out of his epiphany? Sometimes, if I don't like the way a story ends, I'll twist it and imagine it ending the way I want it to." (Q 108)

"I can't remember when I did not image something before doing it. However, often before teaching a class, I will image what I want to happen during the period in order to catch loose ends that I may have overlooked. When I ran a good bit, I imaged how to breathe and pace myself. I heard one time (when I was in high school) that one should spend time imaging his success as a basketball player as well as practicing physically. I would spend time thinking about stance, trajectory, etc. I found the same application to tennis. . . . Recently I find myself rehearsing many conversations in my mind, trying different emphases on words, preparing for the different kinds of responses those words might engender. " (Q 154)

STREAM OF CONSCIOUSNESS

". . . sometimes when reading or listening you hear a word or a description that you relate to something else, maybe an object in your home or a friend, and this gets your thinking to stray from whatever and go completely off on a tangent." (Q 85)

"My mind flits from one idea to a totally different one--sometimes this is helpful, though, as in my paper when I was writing and a totally new point of view popped into my head." (Q 105)

"Sometimes I just sit 'catatonic-like' and let my thoughs run their own course. Different images of people, places, and happenings run through my mind until one particularly 'jars' me out of thought. Aha! the Divine revelation strikes. I go from here." (Q 108)

GENERAL MENTAL SKILLS

Habitual, reflex: "As I walked through the elementary school last week, I took time to look at the childrens' work posted in the hallway. I looked at the math worksheets, and saw that the second-graders were learning the base-ten number system. Hundreds, tens, and ones were represented by bundles of sticks containing the respective number of elements. Three bundles of one hundred plus five bundles of ten plus seven individual sticks equals 357. As I looked, I remembered learning through those images. But now I don't need them. They are a mere reflex. I know what 357 means without having to picture bundles of stricks." (MPE 3) (This is an explanation of abstraction through habituation.)

Sports: "I used to play tennis matches in my head before I ever stepped onto the tennis court, trying to plan strategies." (Q 157) (This is also an example of projection.)

Meditation: "I do a lot of meditating -- using quiet time to reflect on what I have read and heard and seen. Meditation seems to allow the absorption and molding process to

occur -- turns chaos into meaning. I have also noticed that a state of rest -- no reflections -- just rest helps me to gain re-vision, a new look at it." (Q 110)

Universal: "I sometimes find myself deep in though and suddenly wondering about the exact chain of events that prompted these images." (Q 150)

DIRECTIONS

"I have two major memory modes -- if I am consciously attending to an item -- directions, for example -- I use a computer model and open a mental file. I visualize the words on a screen. If details are given -- turn right at the grey tudor cottage' -- I will include a picture. Sometimes an aroma is important -- 'then left at the pig farm.' I can usually 'hear' the instructions being given." (Q 155)

"When I listen to someone give directions, I visualize landmarks. Sometimes I know what the landmarks are, like Capstone, for example. Sometimes I don't but I can imagine: convenience stores, trees, traffic lights, etc. (Q 153)

THINKING IN GENERAL

Use of maps for FOCUSING: "As top-down is a way of thinking things, it is also my way of imaging things. . . . I like to look at maps to find shortest distances, relative sizes, population densities, whatever a map can tell me. I'll stare at the map and imagine the place that I'm looking at. When looking at a world map I think of the size of Russia and the Communist threat. On a country's map I often picture jungles, riversides, farms, mountains, or cities. On America's map I always picture the people moving away from the city -- moving from New York City into the suburbs of New Jersey, away to

the Sun Belt cities, and out to the country. . . . I've stared at the map of New York City for hours and hours, and I have a certain command of the streets. I've never lived there. I've never even spent the night there, but I know the streets and subways of Manhattan -- from Harlem to Battery Park -- mainly from looking at maps." (MPE 3)

"As far as school, I actually can pretend (image) myself as the teacher who 'knows it all' and can remember what's important during a lecture." (Q 146)

"I can't think of any non-image mental processes. Even my thinking about logic includes images of words and space.

". . . try to figure out what comes before the sentences in my head. Do my ideas exist formlessly before they speak in my head? I don't know. I think something exists before the sentence, but I don't know what. I can't 'see' it." (Q 158)

CONCLUSIONS in relation to GUIDING QUESTIONS

In the preceding section reporting the data, I have chosen examples from a large body of data, with the attempt to select a representative group of answers. In the conclusions that follow, organized by the inquiry questions, I summarize and comment upon some of the more notable examples from the data.

1. Does everyone image? Is imaging universal?

The main piece of information I gleaned from the Questionnaire is that one hundred percent of people image. Imaging is universal. It can be used for all learners.

2. How are the senses related to imaging?

Imaging can be seen as a general mental process underlying visual, auditory, feeling, smell, taste, and integrated sensory experiences (as well as other variations on the senses that are being discovered). If, as I discuss in the theory section below, all thinking is tied to sensory imaging, it may be that sensory imaging comprises an internal mental representation system that underlies all thought processes that we are conscious of.

3. How do different individuals use imaging differently?

My questionnaire supports the general psychological view that learning styles from person to person are somewhat different, especially in which sensory mode is most easily used. Often one sense is identified on the questionnaire as being a dominant sense in imaging (sometimes when I have not asked that question, and some other times when I have asked it).

An example from National Public Radio news shows a strong sense of imaging in the visual sense: A music critic says that the John Coltrane/Johnny Hartman Album "Lush Life" is the best album ever. When asked by the announcer which he would take to a desert island -- baseball or this album -- he said that he would have to take the album with him because he would not be able to imagine the music, whereas he could take a mental picture of a baseball game (I would say this is visual and kinesthetic both--the mind's "motor").

However, some people can hear very clearly in their mind's ear:

"I do 'hear voices' and still frequently amuse myself in boring situations by listening to a favorite song in full stereo reproduction." (Q 155, Phillip Jones)

The range of uses of imaging in individusls is as diverse as are individuals themselves.

4. How do we use imaging for literacy learning?

The examples from the data can be divided into two categories for easier discussion. In the ways people use the imaging that comprises the momentary stream of consciousness, two different modes operate: first, a more passive observation of the imaging automatically streaming through the mind, including what we normally think of as memory, dreaming, and day-dreaming; and, second, an active construction in the momentary stream of consciousness of images that the thinker decides to generate, which I call projection.

WRITING

Writers describe tapping into and passively observing the stream of imaging that automatically comes to awareness, as well as actively wielding the mental imaging to make it do for them what they wish to do.

AUTOMATIC STREAM OF IMAGING

They work from the automatic stream of material "flashing in the mind," a view of imaging reflecting a sense of the electrical activity described in the model of imaging I present in the theory section below. First, dreams provide images to use in writing. Or

in waking life, the writer focuses on the images that arise unexpectedly during other activities that don't require full mental concentration; washing dishes or taking a shower are two of the examples most commonly given. This stream of imaging keeps running much of the time and provides the content of everyday mental life.

When a writer is truly involved with material, it becomes a part of that automatic stream of consciousness and can arise at any time. According to one writer, the inner dialogue in mind turns to focus on an idea that is dominating thought, such as a paper that has to be written. Sometimes while writing, writers can hear in their auditory imaging texts from memory. These might be texts they have read or that they themselves have written earlier. Writers also use their auditory imaging in trying out words, phrases, and sentences in mind before setting them to paper.

For another writer, the mind flits from one idea to another while writing, and a totally new point of view can pop into mind. This kind of observation of the mental stream contrasts with the consciously projected activity of the writer who says that turning the mind to work on a piece of writing is like focused day-dreaming.

CONSCIOUSLY PROJECTED STREAM OF IMAGING

In my own experience, I find that writing itself is a way to focus my thoughts, or my stream of imaging, upon something that I need to plan, to do, or to write. Writing down ideas, lists, or outlines while I think, for instance, keeps my mind focused on my work. The visual representation of the ideas that I can read back over recaptures and re-focuses the stream of imaging that wants to flit off in myriad directions. With the written visual representation held steadily there in my consciousness of what I have done toward a piece of writing, for instance, I can approach it again, then, more

passively; and this next approach in itself will produce another active imaging session in which I again plan, write new material, or revise. It is a rhythmical, reciprocal action back and forth between active projection of images in writing and then letting that same written material stimulate the unbidden flow of new images.

Another way writers actively use imaging is for projection of audience. The writer images the audience, perhaps a specific person or an imagined group at a conference, holding them in mind to generate possible reactions to an idea, or to analyze what the audience knows and what about the topic at hand might interest this specific audience. Complete dialogues can be played out in mind, both to anticipate reaction of audience and to generate ideas for the piece of writing.

Writers of stories actively picture scenes that need to be written, holding them in mind as the source of the descriptive passage; while more academic writers of non-fictional, explanatory, persuasive or argumentative pieces actively associate ideas with visual images as an aid in ordering their material. For instance, one writer imagines a technical piece as a progressive action. Another academic writer uses a spatial separation grid for organizing information. This suggests that external structures such as the visual grid, or the structure of the five-paragraph theme that is so universally taught, can be used internally in imaging as mental structures for help in organizing material.

The writer who describes becoming aware of imaging in the drafting process only when progress slows down and searching is necessary for the next words presents an interesting point of view. This writer -- caught up in the drafting process -- is probably focusing all mental attention on the auditory stream of language she is creating, seemingly automatically at this point after the intense preparation for drafting. Her

lack of awareness of imaging might correspond to much of our everyday thinking in which the imaging becomes so automatic that we don't even notice it. Another example is the lack of awareness in our minds of imagery in response to language. The infinite repetition of language in our minds from the time of language acquisition on through our lives develops a mode of habituation. The image connected to the word becomes so familiar that there is no longer any need for consciously re-experiencing it.

Spelling has always been an interesting case to me. It was one of the mental phenomena that made me aware of my own imaging through the ability I recognized in myself of being able to see words spelled in my mind's eye. It is one of the examples that illustrates how individuals differ in the strength of imaging in the different sensory modes: some see the word written visually and some hear the word spelled aurally in mind.

Visual images of structure help writers to see spaces where ideas need to be explained and where structures need to be connected. For some, visual images structure reading material for examinations and for use in academic papers.

READING

Though reading may be considered a more passive activity than writing since the reader is not generating language on paper, reading is a very active process. It is active in the sense of creating images in mind in response to the written word.

According to one reader, it is the mental images that make the reading material comprehensible. What is actually happening is a translation of the marks on paper (the

symbol system) into the medium of imaging, which is organic to the body-brain. The images are what the body-brain, or the mental system, is able to experience.

A reader from another culture described reading for understanding and memory by applying the ideas to the familiar mental images of his own country. In other words, he used familiar associations to internalize the reading. This kind of understanding of the concept of reading might be a key to teaching reading to those who have difficulty with it. It would mean working more directly with the imaging experience and its relationship with reading.

In their academic studies, experienced readers report that they assign information to mental places; then when the information is needed, they can go there in their imagingation to retrieve it. Or, mental images may be attached to material to be retained, which is one way people with strong powers of memory explain their ability. Some remember photographically, going into the imagination to retrieve information from a photographic mental copy of a page they have read.

Another reader reports that meditation upon what is seen, read, or heard allows for an absorption and molding process to occur, and is thus a way of re-visioning the material. This is a matter of holding the material in mind and going over it again (and again and again).

In study of other subjects, concrete visual images are used initially with young children and then by individuals themselves later on for learning abstractions like mathematics. The first experiences of numbers must be very concrete for realization of the mathematical reality, such as what "5" means. With time and practice, the

realization of what 5 is becomes very automatic, or habituated, and a picture five things is no longer needed for comprehension.

5. How do we use imaging for thinking in general?

I suggest below in the theory section that the experience of thinking that we are capable of being aware of is imaging. We can passively observe the running stream of imaging that comprises the thought process, or we can take it upon ourselves to more actively generate the imaging that we desire. Often what we generate is in the sensory medium that is most accessible to us as individuals.

For instance, we translate abstractions into **visual** images, like the mathematics example above or like the example in the data of using an oval shape to represent the passage of a year. The visual learner learns to knit by generating an image of counter-clockwise movement to guide her movments, while a band member plays from visual memory of musical measures. We might passively hear a song caught in the mind, over and over, or we might, if our **auditory** imaging ability is strong enough, actively create music in our minds to entertain ourselves.

The **feeling** image is used to anticipate if some action will have good or bad consequnces, while a more **integrated sensory** image may be used to create scenarios and try them out mentally before they occur in external reality. Imaging in the different sensory modes is how we map the world for ourselves in memory so that we gain familiarity and find our way around in the it. Often people respond to questions about their imaging by giving examples of how they respond to directions. One person images entering directions someone speaks into a computer file. He generates visual images of

the familiar visual landmarks, but makes up images for unfamiliar ones, and reports, as well, using **smell** (such as a pig farm) to help make the image more vivid.

One of the most important uses of imaging in any kind of thinking and learning is projection. Through actively wielding the stream of imaging, we plan the actions we will take. One person always plans shopping, while another projects the worst possible outcomes to a situation as a means of motivation to frighten herself into doing or not doing something.

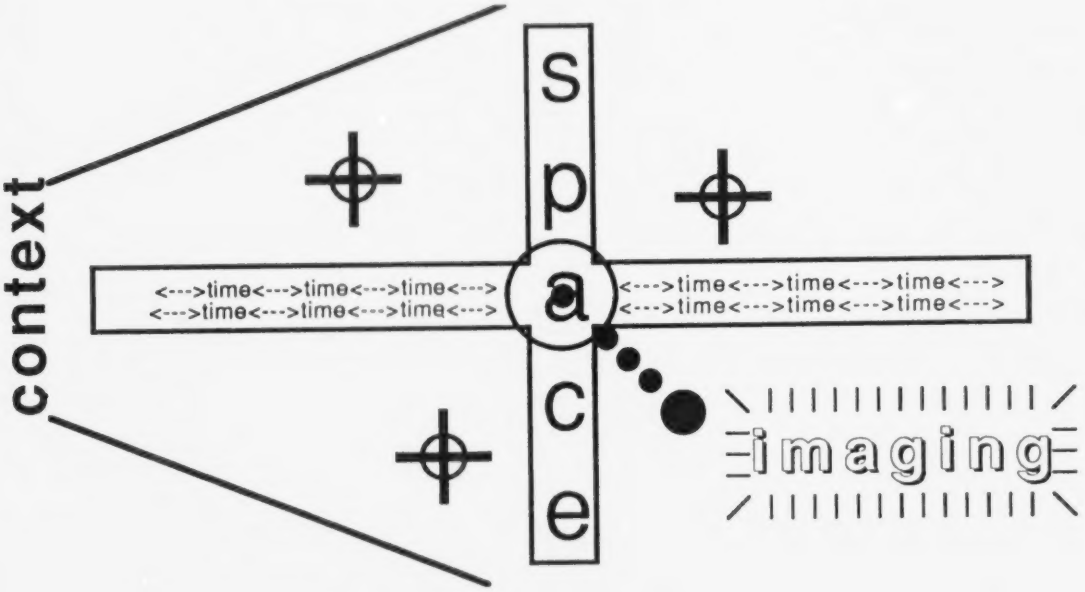
Projection allows us to rehearse any kind of situation we might need to prepare for by trying it out before actually doing it. The teacher rehearses in preparation for a class in order not to miss covering anything important. In sports we picture an opponent's action and our own response and decide how to act in a given situation. We gain experience before conducting personal affairs, or we rehearse an upcoming conversation or discussion.

Perhaps one of the most important aids to our thinking and learning is the experience of success (with the experience of failure being just as important in the negative sense). The past success that spurs us on is an image, and we have gained that image of success by experiencing success in the past. Once the learner has imprinted in the nervous system the feeling -- the emotional reality -- of what it's like to be successful, that image is available for building further successes. Thus, imaging again underscores the importance of experiencing success as a basis for further learning.

A THEORY OF IMAGING

I present the schematic drawing below in an attempt to communicate my own image of the role of imaging in thought.

A very all-inclusive **context** grounds a given thought-action. A thought takes place in an individual mental system at a very specific moment in **time** in a particular place in **space**. What emerges at the perceived surface of individual consciousness is the act of **imaging**, shown here as a shining electrical activity. The smaller **cross-circles** represent the unlimited potential for thought-images generating out of other individuals -- or the same individual -- in other times and spaces, each in its own unique context.



CONTEXT

Notice the lines emanating out from "context" and imagine that they extend on out, signifying that context is the total background against which anything takes place. Context includes everything, everything that is, was, will be, can be. It includes all of culture, all of cultural knowledge, as well as all symbol systems -- all are a background upon which momentary events take place.

The more immediate context in which mental events occur is the human body, with all the experience a person has accumulated. As I will show below, scientific knowledge of biology is a part of this context: the genetic code shapes the body's communication system -- the brain and its extensions, the nerves.

(The Diagram Group, p. 11)

The nervous system reaches every part of the body--the eyes, ears, nose, mouth, skin, muscles, joints, internal organs; it thrusts up through the spinal cord to culminate in the brain. The nerves power the senses that gather and feed information to the brain for processing. The electro-chemical nature of nerve information must also be considered as part of this biological context: electricity carries nerve impulses, while chemicals also exert control over the origination and movement of these impulses. For instance, it is well known now that chemicals underlie the emotional states we experience. The nerves pervade the whole body, forming the human body's communication system.

THE MENTAL SYSTEM

(The human body's communication system)

Central Nervous System

- brain
- spinal cord

Peripheral Nervous System

- cranial and spinal nerves
- autonomic nervous system
  - sympathetic
  - parasympathetic

The core structure in the Mental System is the Central Nervous System, which is comprised of the brain and spinal cord. In these areas most of the mental processing occurs. The Peripheral Nervous System provides the outerlying communication lines that bring messages to the Central Nervous System. Cranial and spinal nerves enter directly into the head and the spine; their extensions reach out to the surface of the body for messages from the outside world through the sensory pathways, and they reach inward to its innermost recesses to carry messages about the state of the body itself, such as pain.

The Cranial Nerves may be the most spectacular ones. While most of the other nerves of the rest of the body enter the brain through the spinal cord, the cranial nerves from the eyes, ears, nose, and mouth are so closely related to the brain that they enter directly into the brain. In fact, the eye begins its development in the fetus as a direct extension of the brain rather than a separate organ (Stephen Rose, The Conscious Brain, 1976).

U. S. News Books, p. 29

One interesting thing to note in the close-up view of a nerve is the wide fan shape of the dendrites -- the extensions that reach out to touch the dendrites of other nerves in the body. The structure of these nerves includes what is called a myelin sheath--a white, fatty substance that covers most of these branching dendrites. This coating forms a protective barrier against electrical communication occurring where such coated dendrite nerve endings cross each other, a complex cross structure that you can observe in the following picture of nerves overlapping each other.

U. S. News Books, p. 36

However, consider this interesting additional fact: at the fine-haired ends of these nerves, the myelin sheath coating does not exist. One brain researcher, Karl Pribram, Neurobiologist at Stanford University, wonders exactly what is the function of these un-coated endings of nerves overlapping each other? Is this the place from which

the particular unsummoned images emerge -- the images that pop unbidden into the ongoing stream of consciousness? This is one of the questions that is yet to be explored through brain research.

All of the above -- including the whole field of neurobiological research -- must be included in context.

TIME AND SPACE

Time and space -- represented in the vertical and horizontal cross bars of the model -- cannot actually be separated. Quantam theory has given us the concept that all the molecules of the matter forming space are always moving in time. Thus time and space form an inseparable unit. I experience this actual moment as the confluence of the two, where I am in time and where I am in space, and how they act together. The meaning of a spatial entity is influenced by its position within a particular temporal setting. For instance the concept "Father" may take on a different meaning to me tomorrow because of the changing circumstances time brings.

Time and space are two of the very basic abilities of the brain. Inherent in the temporal is the concept of movement, basic to our actuality as well as to the internal imagery represented in the brain. Time implies constant movement; it cannot be stopped. Think of a moving picture, or the continual activity we experience in our mental imaging.

Space, on the other hand, can be understood as movement stopped: for example, you can see it as the freeze-action frame when we stop a film. We can hold that picture still in space in order to study it more carefully.

Now think of one's own life in terms of space and time. At any given moment in time, the space one is in affects consciousness. It is the junction, the intersection of any given moment in a given space, considering all the rest of the context, that determines the meaning of that moment.

IMAGING

Imaging, then, emerges from that time-space juncture as the stream of running images occupying the center of attention at any given moment; it is the mental reality of a person at that moment. Though I am not saying imaging **is** consciousness, it can be seen as the way we experience consciousness.

Imaging can be regarded as the medium through which the body-mind's communication system is made known to the awareness of the thinker. If it is the medium, then it is also the message, as McLuhan would say. The meanings that we are able to grasp are dependent on the qualities of the medium itself, in McLuhan's terms: television, for instance, brings visual information immediately, from anywhere in the world (or from outer space) directly into our homes. It is common cultural knowledge now that Americans' attitudes toward war were influenced by the fact that pictures of the horror the Vietnam war were brought directly into our living rooms.

The key to the **medium** of imaging is that it is sensory in nature, and that it is tied to the capabilities of the human body's nervous system. We can never completely understand how learning works until we take into consideration the nature of the brain-body and how it works.

The **message** of imaging is that the nature of its medium is sensory. The biological nature of the senses prods us to seek fuller awareness of them in scientific knowledge of the human body's mental system. Our thinking is highly dependent on the senses. Because the internal representation system is largely tied to the senses, they determine to a great extent what we are capable of knowing through this mental system. This mental system draws its representational ability from imitation of the senses. Both perception and momentary awareness are products of this presentation through the senses, as well as the re-presentation of memory or projection.

Psychologist Rudolf Arnheim argues that "No thought processes seem to exist that cannot be found to operate, at least in principle, in perception" (Visual Thinking, 1971, p. 14). Neurobiologist Karl Pribram suggests that the qualities of the brain determine its language, and this language is related to the perception of sensory information. As Pribram states, the brain is isomorphic with the senses (1982, lecture, ISISSS, University of Toronto). Sensory information, the language of incoming information, underlies the imitation process of the brain, which is imagery. It is the language that the brain and nervous system are capable of handling. It is the mental experience that creates our interface with the world outside us.

A metaphorical way of imaging image-as-message is to consider its place in the general context of thinking. Mental activity is a pool that runs deep. This activity is very complicated and it never stops -- even such activities as sleep are active processes generated in the mental system. Many of these activities we can never be aware of, such as the automatic mental operations that prod continuous heartbeats and regular breathing, as well as other operations like the production of chemicals that regulate moods. All of these messages are being sent, received, and acted on continuously, automatically, piloted by the brain, day in and day out, continuing as long as life exists.

However we are aware of some mental phenomena, such as remembering, dreaming, projecting, and attending to sensory stimuli in the immediate environment. They are the operations that we experience through imaging.

Imaging, then, can be seen metaphorically as the moving shadow reflected off the silvery surface of the pool of consciousness. The electrical charges from nerves throughout the mental system emerge in the brain and reveal to our consciousness messages in the medium of imaging.

The goal of this inquiry on imaging is to help learners identify their imaging and learn to use it to achieve what they want to learn.

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